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## **Analysing the risks of individual and collective intentionality**

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The risk assessment of complex systems often seems to neglect the way in which intentions, collective and individual, are central to our explanations of how risk arises in such systems. Contradictions among the intentions of different actors, for example, are typically an important part of our understanding of how organizations break down. Moreover, risk assessment practice pays little attention to the reflexive problem of how intentions for the risk assessment itself can themselves become problematic. This study was an attempt to develop a framework to support reasoning about intentionality, both individual and collective, during risk assessment. The framework broadly follows a process of 1) identifying the main social objects in a system, 2) asking what are the collective intentions for these objects in terms of the functions that are conferred on them, 3) asking what obligations and powers these create, and 4) asking what risks of organizational dysfunction can then arise. The approach was applied in a case study of aviation ramp operations. Its main value is as a formative rather than a summative kind of analysis.

**Keywords:** risk assessment; social context; intentionality; reflexivity

### **Introduction**

It does not seem odd to say that what we risk, when we operate a complex system, is very much a function of what we intend. Such a system is usually the product of an intention to engage in some activity; its intrinsic physical hazards arise from an intention to employ large quantities of energy, harmful material and so on; its potential for breakdown arises from the potential of individual actors within it to develop intentions that contradict one another. We are used to the idea, for example, that technologists can have intentions for the way hazardous materials are handled that are completely at odds with the intentions that the users develop – in the way that was seen with the agricultural pesticide 2,4,5-T (Irwin 1995). We are similarly used to the ways in which actors add patches and shortcuts to systems, both technical and social, that contradict the intentions of its designers (for example Weir 1996; Snook 2000; Vaughan 1996). Actions like these tell us that what people intend, whether individually or collectively, is central to our explanations of how risk gets produced. Yet the analysis of intentionality rarely seems to be a principal part of risk assessment.

This is perhaps explained by the way in which the complex pattern of social agreements and collective intentions are ‘weightless’ to us, in the sense that, having been brought up in a culture, we tend to take it for granted (Searle 1995, 4). We are used to the idea that computationally-oriented risk analysts self-censor out of their analyses those elements where ‘data’ are lacking (Fischhoff et al. 2006), which seems

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to mean a concentration on material properties and observable behaviours to the exclusion of malleable, mental states like intentionality. And our methods of human reliability analysis emphasise random variations in performance, not deliberate, wilful action – despite its central role in events like the Chernobyl accident (Rosness 1992). The basis of such methods in a highly atomised view of individual action (Hollnagel 1993) means that any notion of collective intentions seems to be entirely beyond analysis.

There can also be little acknowledgement within a risk assessment of the broader system of which the assessment process itself is a part – and the problems that arise in the intentions of those producing and consuming risk assessments. Risk assessment changes the world it analyses (Adams 1995), for example: once a risk is analysed there is a different state of preparedness towards it, people may be able to avert it completely, and at the very least there is usually some obligation to take mitigating action. Thus, whether the intention of a risk assessment is to influence the system under analysis or come to some summative view of the risks it produces is important to how it is interpreted. We have also come to accept that an assessment ‘expresses a political-ethical position, most obviously in its choice of outcomes to predict’ (Fischhoff et al. 2006). Thus lying behind it is not just an intention to perform a risk assessment but to perform an assessment of particular classes of risk.

It is similarly important for the practice of risk assessment to take account of how the intentions behind it become compromised or misread. The way in which assessments are open to socio-political ambiguity (Klinke et al. 2006), and the characteristic failure to identify multiple social meanings (Horlick-Jones 1998), seem to say that the intention behind a risk assessment is to avoid, rather than engage with, the problems of finding common understandings of a risk. The way assessment is often conducted at the end of a detailed design or planning process, by which time it is too late to influence the design or plan, points to an intention to make risk assessment a token gesture rather than a substantive measure. It is often conducted by ‘captive consultants’ who are shared by both regulators and industry (Otway 1992). It can be so contested that no actor can mobilise sufficient resources to act – either for or against the technology in question (Renn 1992). And it can be undermined by the ‘institutional attenuation’ of risk (Rothstein 2003) that follows from uncertainty and fragmentation among the risk-managing organizations. We are also now coming to understand how the intentions of risk managing institutions are to manage the reputational risks to themselves, in a way that casts doubt on the idea that risk assessment reflects an intention to protect society first and foremost (for example, Power 2004; Rothstein et al. 2006). All in all, it looks inadequate for a risk assessment process to neglect the reflexive exercise of analysing what various groups intend the risk assessment to be for, and what puts these intentions at risk.

There are three other reasons for taking more account of intentionality in risk assessment. The first is that it is quite normal to use intentions to make sense of activity in complex socio-technical systems. Trying to perform an exhaustive, bottom-up causal analysis of people taking actions in such systems looks far more forbidding than relying on a top-down analysis of their intentions (Rasmussen 1986). Second, we use intentions to hold people responsible. Once outcomes can be controlled by intentional agency, they can be the subject of a normative system of some kind (Malle, Moses, and Baldwin 2001). Whether such a normative system

works is often fundamental to whether an organization manages, or fails to manage, the physical hazards of the technologies it operates. Third, we use intentions as a basis for evaluating performance. We think of human error only in relation to intentional actions (Reason 1990), and it often seems as though our intentions, and departures from them, are available to our consciousness in a way that the motivation and execution of our actions may not be. So not only do we need a concept of intention before analysing error, we also benefit from talking about intentions when trying to understand why actors in systems do the things we see them do.

## Background

### *Individual intentionality*

In the most general sense, intentionality is simply the property of mental states – like beliefs and desires – of being directed toward something, but in normal usage it is specifically about acting in a way that is purposeful, or meant (for example Malle, Moses, and Baldwin 2001). This second idea is exemplified in Bratman's (1987) work on intentions as partial plans – plans for action that we cannot yet, at a particular point, make complete. Whereas we can often hold contradictory goals and desires, once we have intentions – as plan-like commitments to action – we have generally got to the point of resolving any contradictions. As a result, Bratman (1987, 22) argues that intentions control our conduct, rather than merely influence it. They have stability or inertia and so resist reconsideration; they are inputs to further practical reasoning, for example when we develop general intentions into more specific ones; and they help us achieve coordination in our actions. They are often the result of deliberation, but they do not have to be. They might be inherited from a background of prior intentions or from policies that we develop in order to deal with recurring circumstances (1987, 87).

It is fairly obvious how such qualities make intentions an interesting subject for risk assessment. Their stability or inertia might create an excessive stability of behaviour in rapidly changing environments; they might become detached in some way from the action they are associated with (Reason 1990, 71) as they are overlaid by other demands on actors' cognitive resources; or they might be inherited from a background of policies that do not happen to fit the immediate circumstances. Since they are inputs to further reasoning, intentions also steer our perceptions. Rasmussen (1986, 13) points out that how people perceive the functional properties of an object depends on their intentions – and there is no particular reason why these intentions should be shared with other relevant actors. Thus people operating hazardous systems might see quite different possibilities for what to do with them, compared with what had been envisaged by the designers.

Bratman (1987, 124) refers to the important role of classing acts as intentional in holding people responsible. If, through deliberation, someone can develop an intention it means that in some way they could have done otherwise (Pettit 2002, 257). This takes us on to an important part of both Bratman's and Searle's treatments – the problem of 'side effects' or outcomes that are not the central subject of an intention but a known by-product. This is often important in risk analysis because of the way in which risk arises from people knowingly doing things that cause risk (for instance violating rules) but without intending the outcome of a

catastrophic failure (Reason, Parker, and Lawton 1998). Bratman (1987, 139) uses the example of 'strategic bomber', who knows there is a school next to a munitions factory target, but bombs it anyway, and compares this with a 'terror bomber' who targets the school deliberately in order to terrorise the population. The quality of the intentions in the two cases is quite different, and ultimately Bratman argues that we cannot say the strategic bomber kills children intentionally. Such a distinction seems important both in making actors accountable and in finding ways of avoiding their objectionable acts.

There is a similar problem of determining what is really intentional when outcomes are intended, and achieved, but not achieved as a result of the intention. Searle (1983, 86) offers the example of one person ordering another to do something, and the other replying that (s)he was about to do it anyway, but not because (s)he was ordered to. The outcome was what the first person intended but did not arise from the first person's intention and – even though it was achieved – raises questions about the efficacy of the intention. From one standpoint it appears to make no difference whether an outcome, for example performing some safety-related act, is performed because it is mandatory or because the performer thinks it is appropriate. And Reason (1990, 8) regards such cases as curiosities. But our ideas about how 'high reliability organizations' work are very much based on practicing heedfulness and mindfulness (Weick and Roberts 1993). Thus knowing whether people are acting safely because they intend it, or because they merely intend to follow orders, can be central to understanding the level of risk in an organization.

The main problem with the planning view of intention is the implication that an intention is all in place before the action that it applies to. Thus Gibbs (2001) shows that intentions are sometimes emergent products of social interactions. People modify, refine and elaborate on their intentions in the course of such interactions, and they sometimes come to such interactions without pre-specified intentions. Gibbs even describes how, in infant learning, it is necessary for a parent to deceive itself that the infant's unintentional actions are intentional in order to help the infant learn what to intend. And the principle could be extended beyond training infants: one actor guiding or regulating another, more generally, may need to ascribe intentions to more-or-less random actions in order to 'correct' such intentions. The argument is closely parallel to the principle that plans are not so much control structures that precede actions as discursive resources produced and used within activity (Suchman 1987, 2003). As Ames et al. (2001) also point out, perceivers do not ascribe intentions to actors out of detached interest, but as groundwork for actions such as blaming, punishing and avoiding. Therefore it becomes important for people to build socially desirable intentions into their actions in the aftermath of an event, as well as in the lead-up to it.

The implication for risk assessment is not so much that we have to give up on the idea of intentions as being important, but that we need to see intentions as being instrumental both in the sense that 1) they help predict an actor's actions because they lead to them, and 2) they help us understand how actors feel they need to explain themselves, which in turn helps us foresee their actions because being able to explain themselves might underlie how they act. For example we are more likely to see people undermining a system's defences if they can link their actions to socially desirable intentions, whether these intentions were genuine or specious explanations of what lay behind such actions.

### *Collective intentionality*

It is hard to think of many systems, of interest in a risk assessment, that involve individuals acting in social isolation, so it becomes important to look also at the notion of collective, shared or joint intentionality. Some accounts of collective intention retain an emphasis on what is in the minds of individuals. Bratman's (1992, 1993) view is that it consists of a web of individual intentions that must 'mesh', in the sense of being coherent and consistent with one another. In addition, all the individuals must aim at the efficacy of their counterparts' intentions: 'each agent must treat the relevant intentions of the other as end-providing for herself' (Bratman 1992). Searle's (1990) treatment of collective intentions is similar to Bratman's in being about attitudes or states of mind that exist only in individuals. But Searle argues that the state of mind associated with a collective intention cannot be reduced to that found in individual intentions: it is a 'biological primitive'. This implies, somewhat oddly, that an individual can have a collective intention that is mistaken, in that no-one else shares it. But this reflects, perhaps, a common observation that individuals can act as though they were acting collectively and yet find they are doing so alone.

The main criticism of these accounts is that they neglect social obligation and the general context of social relations (Meijers 2003). Meijers argues that social relations are central to having collective intentions, and such collective intentions are based on prior agreements that have bound the participants in various ways. This binding seems central to the operation of many social controls: work on the role of organizational artefacts in systemic failure (Busby and Hibberd 2006) indicates that quite often rules and norms simply fail because they lack 'normative force'. Whatever collective intention there is to be bound by such rules, individuals feel insufficient obligation to uphold the intention. The issue of obligation or commitment is also central to Velleman's (1997) account of collective intention, based on Gilbert's (1990) 'pool of wills', where 'each person expresses a form of conditional commitment such that only when everyone has done similarly is anyone committed'. Rather similarly, Tuomela (2005) proposes a 'bulletin board view' of joint intentions that emerge when a set of individuals commit – in a way that is visible to all of them – to some kind of proposed intention. Pettit and Schweikard (2006) suggest that people, as a social species, are predisposed to having and advertising these conditional commitments – inviting others to have similar commitments and enter into a collective intention to do something. Our language seems to reflect this: Gilbert (2006) argues that we see people being jointly committed to intend doing an action as a body that is simple, or singular, when they make statements like 'we are walking to X', as opposed to 'we are *both* walking to X'. They are not just coordinating their actions but creating a relationship among themselves, such that each is obligated to the others to conform to the commitment, and they are answerable to each other if they default on it. Tollefson (2002) similarly is in favour of seeing collective intentions as genuine intentional states in groups, not just as qualities of individuals in a group.

All this seems to be especially true in organizations, and we often appear to deal with organizations as though they can have intentions in their own right. They can own property, enter into contracts, and even be reasoned with (Pettit and Schweikard 2006). Pettit and Schweikard's argument for collective intentionality in organizations is they have to adopt decision processes, like majority voting, that at

some time will inevitably encounter inconsistencies. In resolving these inconsistencies the group will adopt judgements that do not reflect the intentional 'profile' of the majority of members, and possibly not even that of any of the individual members. The organization is therefore a distinct agent, and has its own intentions to enact. Tuomela (1993) in fact refers to the notion of a 'corporate intention' explicitly, although this is often less an emergent product of individuals taking decisions together and more a matter of identifying corporate intentions with the intentions of senior officials. On the face of it this is a less sophisticated view. When looking back at deeply flawed intentions in hazardous systems we often seem to see a distinctly collective intention that arises from the structure of decision processes as much as the intentions of any one official.

### *Intentionality and risk assessment*

An important application of the idea that there can be collective intentions is that they lie behind social objects like money, marriage, property and government (Searle 1995). These objects have functions because there is a collective intention that they should have a particular role in a particular context. Their physical manifestations are sometimes arbitrary, and often change over time: it is a social agreement that confers on them the functions they have. We are not always conscious of this kind of collective intention, but it is built in to our capacities and skills when we deal with such social objects. And these objects are usually prominent features of the complex socio-technical systems that we analyse in risk assessment. In the case study we use in the next section – aviation ramp operations – social objects are legion, ranging from contracts to rules to signage. The 'ramp' itself is a social object that is only a ramp because there is a collective intention that it is a ramp: the fact that it has a certain physical form does not alter this. Similarly, the aircraft 'turnaround' and the time 'slot' in which it is accomplished are collective intentions as much as physically observable entities. In the next section we list some of the incidents that have occurred in this setting, and most if not all have at their centre a social object of this kind. We have therefore made social objects, and the collective and individual intentions that arise in connection with them, the focus of our approach to augmenting risk assessment. The general process we are proposing is as follows:

1. The identification of the main social objects in a system.
2. The identification of the collective intentions for these objects in terms of the functions that are conferred on them.
3. The identification of the obligations and powers that these functions confer on actors in the system.
4. The identification of risks of organizational dysfunction that arise in these obligations and powers – for example from individual intentions to meet these obligations even when they are somehow problematic in the context, or from individual intentions to set these obligations aside for some contextual reason.

The outcome of this kind of analysis is inevitably less definitive than a probabilistic assessment of physical mechanisms of breakdown and harm. This implies that its purpose should be formative, not summative: it should be carried out to enhance the

understanding of those carrying it out, not to provide a definitive measure of risk to the world at large. But it is hard to imagine how a credible probabilistic assessment of physical events like collisions could be carried out without first working through an analysis of how actors' intentions can lead them to jump stop signs, misinterpret air traffic controllers' instructions, and bypass mandatory procedures.

## Case study

### *Ramp operations*

Ramp operations are those activities concerned with the reception, preparation and dispatch of commercial aircraft. The ramp is the air-side hard-standing on which aircraft are parked. Activities that take place on the ramp include towing aircraft onto, and pushing them off-stand; securing the aircraft; removing and loading passenger bags, dry freight and animals; deplaning and emplaning passengers using buses or jet-ways; providing transport for flight crews; removing dry and wet wastes; refuelling; replenishment of fresh water supplies; catering; reactive (unplanned) maintenance if it is necessary; de-icing the aircraft if it is necessary; and dispatching, an activity that includes tasks such as preparing load sheets. Many of the tasks can be performed concurrently and some are undertaken by a single contractor: for example, aircraft towing, baggage and freight handling and de-icing. Although much of a turnaround may be subcontracted by an airline or aircraft operator to a handling agent, who can then subcontract the provision of the various services to contractors, there is typically a requirement under regulatory guidance for all parties to have responsibility for adequate safety arrangements. Thus service contracts should not encourage the breach of health and safety law by specifying unreasonable turnaround times and the different service providers should – in principle – take account of the risks they create for each other (HSE 2000).

Ramp operations inherently involve a lot of physical activity taking place within a confined physical space and a constrained time period. Brown (2002) states: '[T]he airport ramp is a jigsaw of systems trying to function under extreme pressures .... The problem with ramp incidents is the diversity of possible error situations/events resulting from overlap activities'. Prill (1999) similarly says: 'The average ramp is a community of relationships .... Managers have to orchestrate a great deal of activity in a small area around [an] expensive piece of equipment in a limited amount of time'. As in most industries there is a tension between production and protection, with some airlines requiring that aircraft be turned around in 20 minutes. Bennett and Shaw's (2003) study of 50 ramp workers at three UK airports found that many admitted to not following procedures. Various reasons were given — including a perception that workplace rules and procedures failed to take adequate account of what it was like to work on the ramp. Workers rationalised violations in terms of the need (as they saw it) to meet production targets. They did so in the knowledge that if they were found out they would not be supported by their supervisors and managers. One respondent said: 'Everyone turns a blind eye until something goes wrong and then whoever has done it cops for it'. Many felt that managers and industry regulators had little understanding of the reality of ramp work, where aggressive competition between the airlines placed a premium on performance. Aircraft were high-cost fixed assets, making money only when carrying a payload.



Accident rates on the ramp have been relatively high: '[F]or ground handling and airport workers, accident rates exceed even those of the construction industry and the agricultural sector' (HSE 2000). According to HSE (2003) figures in 1992/93 the UK airport accident rate per 1000 air transport movements (ATMs) was 0.79; by 2001/02 the rate was 1.04 per 1000 ATMs. This has led to various safety initiatives, such as the European Regions Airline Association's (ERA 2003) minimum safe turnaround time (MSTAT) initiative that encourages airlines to set realistic turnaround targets. The United Kingdom Flight Safety Committee (UKFSC) has used its house journal *Focus* to draw attention to the \$4 billion annual uninsured losses from ramp accidents. And some airport groups, like Heathrow's Airport Users' Committee (AUC 2001), have developed 'best practice' checklists for contractors in an effort to reduce accident rates without reducing turnaround performance.

The nature of what can go wrong in ramp operations is illustrated by a number of recent publications in the aviation trade press summarised in Table 1. We have included in this table both minor incidents, in which there was no significant loss of life or injury, and more major accidents, as all indicate something of the nature of conditions the actors experience.

### *A sample analysis*

In Table 2 we present an example of how an intentionality-based approach to risk assessment might work in this context. It follows the principle laid out earlier of organising the analysis around the main social objects to be found in the system. The first column lists these objects, and the second column the functions that we would expect to be imposed on them by collective intention. The third indicates what obligations these intentions confer, and the fourth column indicates the risks that follow and the intentions with which they are associated. The social objects are grouped into major categories, more to make the process systematic rather than reflect any theoretical distinction. Thus the first category is of 'major structures', like the ramp itself and the time slot. Risks identified at this level tend to be so general as to be vacuous. But the value of including them in the analysis is that it reminds us that certain risks are built in by very basic commitments – such as the commitment to the idea of co-locating all loading and unloading activity in one small space. The second category is of 'cultural assumptions'. It is arguable whether these constitute social objects, and might be better described as part of Searle's 'Background' against which collective intentions and social facts operate. But the value of incorporating them in the analysis is that they have a similar status, being collective representations of things that determine action. For example expressions like 'keeping the aircraft flying', 'sweating the assets' and 'working the capital' point to cultural elements that can be counted as social objects insofar as there is a collective intention that they are norms governing people's behaviour in this setting. The third category of social object covers 'contracts and remits' – essentially formal agreements about the status of actors and how they should act. The fourth category is of 'routine devices' and this includes the more numerous and more particular objects that structure activity on the ramp – from roles and rules through to physical markings. As with any analytical framework the structure provides a way of organizing and prompting the use of existing knowledge about the system, rather than producing knowledge in its own right. And this particular case study has to be seen as indicative rather than

Table 1. Examples of materialised risk in ramp operations.

Source	Specific incidents or types of incident reported
Anon. (2002). How do you view ramp damage? <i>Focus on Commercial Aviation Safety</i> , Summer, 6.	Passenger steps collided with APU exhaust of stationary aircraft, having been towed in unauthorised fashion sideways not lengthways, aircraft having been stopped by marshaller with tail extended slightly beyond yellow line
Godfrey, D. (2002). Aircraft damaged by de-ice rig. <i>Ibid.</i> , 8.	De-ice rig manoeuvring from one side of aircraft to the other was hemmed in by fuel bowser on adjacent stand and failed to lower boom to clear tail plane wing tip, which it struck
Anon. (2002). Stand discipline: does your organisation have it? <i>Ibid.</i> , 11.	Catering vehicle struck opened forward hold door after approaching aircraft at angle, breaking rules, instead of waiting for obstructing equipment to be removed
Anon. (2002). Helicopter ramp incident. <i>Ibid.</i> , 22.	Helicopter taxied away from stand crushing baggage loader against baggage truck; crew had completed pre-taxi checks with no ground crew in sight but had missed illuminated baggage bay warning light
Anon. (2002). Ground damage at Zurich. <i>Ibid.</i> , 22.	Stairs were pulled away from aircraft at a remote stand before being fully retracted, and driver turned too early in constrained manoeuvring area, resulting in collision with aircraft wing
Anon. (2002). Just another ramp incident. <i>Ibid.</i> , 29.	Steps used to service prior aircraft not removed from stand and left with brake off; subsequent aircraft's engine airflow suction sufficient to draw steps towards intake and removed part left on steps was drawn into engine
Matthews, R. (2004). Ramp accidents and incidents constitute a significant safety issue. <i>Focus on Commercial Aviation Safety</i> , Winter, 4–7.	Surface vehicles striking aircraft during passenger boarding, causing falls
	Taxiing aircraft collided with employee bus as driver ran a stop sign while crew were engaged in completing paperwork
	Crews failed to follow braking procedures on pushback leading to severe injury
	Crews failed to follow engine start procedure resulting in excessive jet blast leading to fire at gate in which aircraft destroyed
	Tug driver failed to set parking brake before leaving tug, then accidentally hit accelerator when returning to tug after setting tow bar, throwing tug forward and crushing driver against aircraft
	Marshallers failing to ensure area behind or adjacent to moving aircraft clear, failing to follow communications procedures and failing to use proper chocking methods
Rash, C.E. (2006). Walking into trouble. <i>Aviation Safety World</i> , August, 29–34.	Employee struck by propeller while walking to chock right hand landing gear after chocking nose landing gear despite instruction to approach from rear
	Official struck by helicopter blade while walking away after checking door securely latched
	Guard responsible for keeping unauthorised people away from helicopter walked into tail rotor despite training session on how to approach aircraft safely

Table 1. (Continued.)

Source	Specific incidents or types of incident reported
Scott, S. (2006). Airport safety: When it comes to the crunch, it's a team game. <i>Focus on Commercial Aviation Safety</i> , Autumn, 5–7.	Taxiing aircraft wing collided with stationary aircraft tailfin after being given instruction to taxi to holding point beyond that of stationary aircraft: probably wanted to depart within slot, and probably believed that ATC approval to proceed meant they were clear of obstacles, which it cannot as many airport vehicles are allowed to free range; official position also that holding points located to ensure clearance is sufficient in front of the stationary aircraft, not at the rear

definitive because a more conscientious exercise would involve a great deal more participation of the actors themselves.

There are some general themes that emerge in this table:

- The first is that the collective intention about an object's function can often be ambiguous or disputed. For example, rules are treated as mandatory and without exception by some (typically managers and rule makers) and as advisory by others (typically workers). This means that the collective intention underlying a whole class of social objects – rules that supposedly embody safe behaviour – is ambiguous or contested. A similar comment applies to what have been labelled 'concessions'. This is meant to refer to agreements, often tacit, between managers and workers that rules can be violated. But this agreement is often such that workers would nonetheless be blamed if an accident arose as a result of the violation, and therefore becomes highly problematic as a collective intention.
- The second theme is where a fairly clear collective intention is set aside because it is the most negotiable of constraints in an over-constrained situation. Again, many rules are implicated here, and so are practices like setting parking brakes on stationary vehicles. The individual actor seems justified in setting aside the collective intention that certain practices are always followed on the basis that skilled performance is an individual repertoire that is learned experientially. Thus explicit, agreed-upon practices do not become the objects of an individual intention when the collective intention is that they should do.
- The third theme is where a social object imposes obligations that lead to intrinsically risky behaviour. Service level agreements that are particularly demanding – for example in terms of turnaround time – are implicated here. The difficulty is plainly that such agreements cannot take account of all eventualities. When actors set out to honour these agreements, and their obligations under the collective intention that underlies them, the result can be behaviour that is insensitive to unspecified goals or unforeseen circumstances, and is therefore risky in those circumstances.

### *A sample reflexive analysis*

We argued earlier that an analysis of social context should also involve an understanding of risks to the risk assessment itself. There should be some way of

Table 2. Sample of social objects and associated risks in ramp operations.

Object	Imposed function	Obligations generated	Risk of organizational dysfunction
<i>Major structures</i>			
Ramp	Fixed space counts as place for all unloading and loading activities	Actors should coordinate in space with multiple other actors	<i>Potential</i> for collision particularly when little effort made to meet obligations <i>Intentions</i> of individual actors directed toward completing individual actions rather than collective actions
Time slot	Period counts as duration of fixed extent at predetermined time for all unloading and loading activities	Actors should act so as to avoid exceeding time available	<i>Potential</i> for short cuts and individuals acting in an unsafe way particularly when effort made to meet obligations <i>Intentions</i> of individual actors directed toward meeting the collective intention to maintain time slots and displace intentions towards safety and rigour (A)
Separation of production and safety powers	One group counts as authority on production, and another counts as authority on safety	Actors should coordinate separate actions to reconcile demands on operators	<i>Potential</i> for safety authorities to stipulate standards that are unachievable given production pressures, leading to attitudes of secrecy <i>Intentions</i> of separated authorities are directed towards their individual goals and fail to acknowledge the need for reconciliation
<i>Cultural assumptions</i>			
Worker-manager distinction	One group counts as responsible for directing activity, the other for performing it	Managers should ensure directions are enact-able, and operators' enacting should be consistent with directions	<i>Potential</i> for collapse of responsibility where the two groups transfer responsibility for outcomes to the other <i>Intentions</i> of managers typically to accept short cuts to achieve production goals but censure them if they produce accidents
Assumption of aircraft that earns money by carrying a payload	Aircraft counts as entity whose time in turnaround should be minimised	Operators should act to minimise turnaround time	See (A) above
Safety construed as compliance	Complying with rules counts as being safe	Actors should comply with rules	<i>Potential</i> for failure to observe unplanned contingencies following from unthinking rule compliance and relaxation of vigilance <i>Intentions</i> to be safe become displaced by intentions to comply with rules

Table 2. (Continued.)

Object	Imposed function	Obligations generated	Risk of organizational dysfunction
<i>Contracts and remits</i>			
Subcontracted services	Subcontracting counts as device to transfer risk to other firms	Firms coordinate sufficiently to manage all risks	<p><i>Potential</i> for client firms to get rid of their capacity to scrutinise subcontractors</p> <p><i>Intentions</i> are to exploit the subcontracting by economising on all expenses and efforts that are subcontracted</p>
Service Level Agreements	Service levels count as targets on which lack of attainment can be penalised	Finding objective ways of assessing performance against targets	<p><i>Potential</i> for stressing targets that are measurable and ignoring aspects of performance that are important but not measurable</p> <p><i>Intention</i> becomes to monitor and meet targets irrespective of performance in other respects</p>
Remit	Remit counts as limit on authority	Limited authority should not act beyond remit; others should act as though authority will not exceed its remit	<p><i>Potential</i> for remit to be confused, anomalous or obscure leading people to assume an authority has more power or knowledge than it in fact has</p> <p><i>Intentions</i> may be based on misunderstood remits and therefore fail to incorporate essential actions</p> <p><i>For example</i> manoeuvring vehicles or aircraft may assume air traffic control clearance means the route is clear of obstacles when in fact ATC's remit is only to assist in averting collisions in the manoeuvring area</p>
<i>Routine devices</i>			
Roles	Roles count as expectations of what any individual occupying a post should do	Role holders fulfil the associated expectations; others support their capacities to do so	<p><i>Potential</i> for roles to be insensitive to circumstances</p> <p><i>Intentions</i> are to fulfil role expectations, not recognise the role's essential rationale</p> <p><i>For example</i> crew checking for unsafe conditions may expose themselves to these conditions – such as collision and falls</p> <p><i>For example</i> use of banksman for manoeuvring means another individual exposed to risks of collision with vehicles</p>

Table 2. (Continued.)

Object	Imposed function	Obligations generated	Risk of organizational dysfunction
Rules	Rules count as constraints on behaviour whose violation can be censured	Individuals comply with rules and rule makers design rules to express safe and reasonable constraints	<p><i>Potential</i> for rules to require behaviours that are confounded by circumstances, contradict prevailing pressures or counter prevailing culture</p> <p><i>Intentions</i> are such as to involve rule violation as a known by-product rather than a particular goal</p> <p><i>For example</i> vehicle drivers violate rules for manoeuvring around aircraft to avoid temporary obstruction under time pressure which discourages them from waiting for obstruction to be removed</p> <p><i>For example</i> vehicle drivers approaching aircraft in proscribed way in order to avoid other vehicle and avoid waiting for that vehicle to withdraw</p> <p><i>For example</i> moving towed or pushed object such as steps by fastest not safest method such as sideways not lengthways</p> <p><i>For example</i> individuals choose not to wear personal protective equipment because it is counter-cultural or because it interferes with free movement or is uncomfortable</p> <p><i>For example</i> individuals cannot wear personal protective equipment which is lost but not admitted because they do not want to appear incompetent</p> <p><i>For example</i> workers approaching to chock landing gear from front not rear as required because it is on a shortest route round the aircraft</p> <p><i>For example</i> drivers operate without a banksman if an aircraft is coming on to the stand before ground operators completely ready</p> <p><i>For example</i> passengers insisting on their 'right' to smoke, possibly in the vicinity of refuelling</p> <p><i>Potential</i> for rules to require behaviours that are risk-increasing in particular situations and thus become generally discredited and lose their moral force</p> <p><i>Intentions</i> come to lack any strong concern with rules</p> <p><i>For example</i> a vehicle is required to have a banksman as it exceeds a height threshold yet has 360 degree vision so exposes an additional individual to risk so requirement is ignored</p>

Table 2. (Continued.)

Object	Imposed function	Obligations generated	Risk of organizational dysfunction
Concessions	Tacit or explicit agreements between managers and workers count as legitimization of violations in specific circumstances	Individuals should limit violation to the specified circumstance; managers should share responsibility if there is an unfavourable outcome	<i>Potential</i> for breakdown in organizational order if the concession is incomplete, with managers approving violation but blaming individuals for bad outcomes <i>Intentions</i> of both parties are to accommodate mutually exclusive demands without revising the rules or goals that bring them about
Practices	Practices count as accepted elements of competent performance	Individuals should follow practices	<i>Potential</i> for competencies to be set aside when learned to be unnecessary, yet actually needed to avert accidents <i>Intentions</i> may be to rely on experientially learned skills that seem more suited to competent behaviour than explicit practices <i>For example</i> vehicle drivers failing to set parking brakes then accidentally hitting accelerator when returning to vehicle
Standards	Standards count as minimal obligations on services or devices	Actors responsible for services or devices should not operate below standards	<i>Potential</i> for operation below standard when not achievable within a demanding time slot <i>Intention</i> of actors is to set aside the constraint presented by the standard if otherwise the situation is over-constrained <i>For example</i> damaged vehicles are left in service in the short term

Table 2. (Continued.)

Object	Imposed function	Obligations generated	Risk of organizational dysfunction
Procedures	Procedures count as mandatory sequences of action for particular tasks	Actors should follow procedures; procedure designers should design feasible procedures	<p><i>Potential</i> for short cuts and departures generally when conditions make it hard to follow them</p> <p><i>Intention</i> of actors may be to follow procedures but their realisation is confounded; strangers (for instance passengers, especially child passengers) are especially problematic as they have no particular familiarity with particular social objects</p> <p><i>For example</i> tired, disoriented disembarking passengers especially infants leaving safe areas on remote stands</p> <p><i>For example</i> crew unable to hold disembarking passengers on steps while waiting for following bus</p> <p><i>For example</i> drivers of vehicles such as de-icing rigs not taking prescribed routes around aircraft when obstructed by other vehicles such as fuel bowsters</p> <p><i>For example</i> crews fail to follow engine start procedure when they surmise it is unnecessary resulting in excessive jet blast and fire risk</p> <p><i>Potential</i> for loss of vigilance because procedures have been executed successfully</p> <p><i>Intentions</i> may be to follow the procedure rather than achieve a more basic outcome thus displacing any intention towards this outcome</p> <p><i>For example</i> vehicles move after completing checks but ignore warnings or individuals in proximity</p> <p><i>Potential</i> for distraction in process of following procedures</p> <p><i>Intentions</i> may be to complete procedures which leads to loss of vigilance during completion</p> <p><i>For example</i> crews fail to notice obstacles to taxiing while completing paperwork</p>
Markings	Markings of various kinds count as boundaries for various activities	Actors should respect boundaries set by markings; those designing markings should ensure they denote achievable boundaries	<p><i>Potential</i> for boundaries to be over-stepped and not corrected under time pressure, leading to the potential for collisions in an even further constrained space</p> <p><i>Intentions</i> of actors may be to avoid correcting small transgressions when correction involves loss of time</p> <p><i>For example</i> collisions of vehicles and especially towed objects like steps with parts of aircraft extending beyond boundaries</p> <p><i>For example</i> collisions with drivers of vehicles 'running a stop sign'</p> <p><i>Potential</i> for meaning of particular markings to be misconstrued even where legitimacy is accepted</p> <p><i>Intentions</i> may be to comply with markings but in fact fail to do so</p> <p><i>For example</i> holding points are located to ensure sufficient clearance in front of an aircraft only but it might be assumed that they ensure clearance at the rear</p>



helping those performing the risk assessment reason about the system of which the assessment is a part, preferably using the same framework as that used in analysing the target system. In this case study, we have chosen a scenario of an airline planning to start operations at a new destination airport, and performing a risk assessment of its ramp operations as part of the decision about whether to use this destination. In practice the assessment would involve a group of people in discussion with service companies, security agencies and security firms, airport managers, caterers and so on.

The analysis, shown in Table 3, follows the same structuring approach as the main analysis, where the 'way in' to the analysis is to look at the main social objects involved, the related functions imposed on these objects, obligations and potential risks. The potential risks are shown slightly differently, with an indication of possible dysfunctions, the related intentions of actors, and then some implications for how to manage the analysis process. As with the main analysis, the concept of a 'social object' is interpreted very broadly.

Again it could be argued that some of the obligations shown in the table seem so obvious as to be not worth stating – for example the notion that risk assessors are under an obligation to test the system owner's claims about how the system works. But it is worth spelling out just what is involved in the collective intention as it may become important to examine this. It is perhaps not an uncommon experience for technical analysts to see the collective intention behind an analysis to be to produce new insight, whereas in fact it may be to merely confirm a predetermined view, or go along with an institutional requirement to conduct an analysis with no particular regard to the result. We are used to the idea of different actors having different 'agendas', so if we are looking for threats to a risk assessment it seems reasonable to think about these agendas. Someone who is party to a collective intention has an obligation of some kind to see that intention realised, and this is the case even when a party develops individual intentions that are at odds with the collective intention. A central aspect of risk to the risk assessment is the potential for this contradiction, and it needs examining if the risk assessment is to get beyond the status of being a mere token, a messy compromise, or a self-serving exercise on the part of one particular group.

## Discussion

### *Intentionality versus causality*

Our premise was the idea that it can be more productive to look at intentions rather than causes when examining the risk of systemic failure. In the light of the case study it seems to us that an analysis of intentions offers five benefits in particular: 1) it helps deal with particular kinds of organizational pathology; 2) it gives insight into the nature of responsibility; 3) it provides empathy for the actors in a system; 4) it provides a better vantage point more generally; and 5) it provides a better basis for mitigating risks.

The first benefit involves the fact that what goes wrong in some failure modes is the development and realisation of intentions, and particularly the relationship between collective and individual intentions. These intentions fail to coordinate, or they fail to generate sufficient obligations, or they generate excessive obligations, and so on. Without an explicit analysis of intentionality it is hard to see how such failures

Table 3. A reflexive analysis of the risk analysis.

Social object	Status function	Obligations generated	Risks
System owner's claims	Claims count as assertions by an interested party to be tested in the assessment	Claimant should furnish the means to test the claims; assessors should test the claims assiduously	<p><i>Potential</i> for fraudulent claims to be taken on face value, or for reasonable claims to be dismissed</p> <p><i>Intention</i> of owners and assessors ultimately will be different and potentially contradictory, so the collective intention that claims count as test-able assertions may be compromised</p> <p><i>Implication</i> is to maintain credibility of the assessment by triangulating data sources, and finding evidence to substantiate claims</p>
List of risks	Risks count as potential threats to reliability or safety that should be understood and managed	Actors should ensure the list is complete as far as is possible	<p><i>Potential</i> for incompleteness</p> <p><i>Intention</i> to undertake a complete analysis indicates being systematic and widely consultative</p> <p><i>Implication</i> is that assessors need to ask how they know they have assessed all relevant risks in a situation that is likely to be new to them in some way</p>
Underlying model or ideal	Model counts as basis on which to make judgements of adequacy of some system	The model should in some way be validated as a basis for judgement	<p><i>Potential</i> for models to indicate misleading qualities or questions</p> <p><i>Intention</i> of assessors may be to act quickly, or defensibly, rather than perform the most insightful assessment</p> <p><i>Implication</i> is that assessors need to ask whether – for example – the model of a European location is appropriate for North Africa</p>
Analysis of system	System counts as normal configuration that might be expected in routine operation	The focus of interest should be on what is realistic and actual rather than what is ideal	<p><i>Potential</i> for system to be misrepresented by the owner or for the system to be observed at an unusually favourable time</p> <p><i>Intentions</i> of system owners may be to present system in best possible light (for example handling all aircraft via airbridges instead of remote stands)</p> <p><i>Implication</i> is that steps need to be taken to understand the normal condition of the system, or the range of possible conditions, or put monitoring systems in place to ensure presented conditions are maintained in practice</p>

Table 3. (Continued.)

Social object	Status function	Obligations generated	Risks
Roles of actors	Roles count as expectations of what any individual occupying a post should do	Actors should broadly conform to the expectations of their roles	<p><i>Potential</i> for commercial and safety groups within an organization to disagree on the significance of a risk assessment that suggests an operation is problematic (for example flying to a destination that poses security risks)</p> <p><i>Intentions</i> of actors that follow from their role-conferred goals can produce conflict that is legitimate but impedes concerted action</p> <p><i>Implication</i> is that while there is a collective intention that people adopt certain roles they also need to set them aside in certain instances</p>
Expertise	Expertise counts as particular qualification or authority to conduct risk assessment	Assessors should claim appropriate levels of expertise; others should limit expectations to fit what expertise is claimed	<p><i>Potential</i> is for the usual characteristic problems that can flow from having an expert community: an insensitivity to what matters to others, an inability to draw on relevant folk or craft knowledge, an inability to have influence on public decisions, or an inability to inject the learning that comes from risk assessment processes back into the system being assessed</p> <p><i>Intentions</i> of experts may be to achieve status among fellow experts and exacerbate the characteristic problems</p> <p><i>Implication</i> is that there is a need for effective mixing of the expert and other relevant communities</p>

will be adequately considered in a risk assessment. In the case study there are various risks of collision that are obvious from the physical nature of the ramp, but it is not obvious how and why drivers and crew will bring such collisions about without – for example – an analysis of individual and collective intentions towards manoeuvring rules.

The second benefit involves the point made earlier that we analyse intentions in order to assess responsibility. *Mens rea*, the intent of the offender, is typically central to the determination of liability in Western legal systems (Edgerton 1985, 31). By looking at the intentions that lie behind a risk we can make some assessment of whether they will be regarded by actors in the system as reasonable or justifiable. If they are not justifiable we might expect social pressures to minimise the chances that the intender will carry out his or her intention. If they are justifiable we might expect such intentions to persist and to be realised. In the case study, intentions to take short cuts seem inevitable given the collective understanding of a ‘turnaround’ and the importance of getting aircraft flying. It is unlikely that such intentions will be socially suppressed.

The third benefit is based on the notion that if we think about actors in a system in terms of their intentions, not just their causal responses, we get a better insight into them as reasoning agents, not merely rational (or irrational) responders to causal events (Pettit 2002, 163). This kind of empathy seems to us to be important if the analyst needs to understand the local logics that actors are likely to follow, how they might arrive at what they regard as being defensible actions, and how the system of which they are a part will make sense to them. As Taylor (1987) pointed out in connection with accident analysis, the mere behavioural analysis of accidents will never be enough, and we must also investigate the antecedents in terms of their meaning to the agents involved. For example, the case study points to the possibility of actors on the ramp developing a natural intention to demonstrate competence, and this seems likely in some cases to lead them to relying on their experiential learning in preference to rules and procedures. Compliance with rules makes their behaviour appear devoid of autonomy.

The fourth benefit, that an understanding of intentions gives a better vantage point, is also an argument made by Pettit (2002, 184). He argues that intentional explanations are inherently normative – giving us a view on what agents are committed to do in some way. This gives us a ‘vantage point’ on the performance of a system because we can often infer that some action will come about even when we are not able to predict exactly how it will come about. The mere fact that it is someone’s intention gives it a good chance of materialising. Thus, for example, we can predict that drivers will do interesting and perhaps hazardous things in order to fulfil an intention to achieve a minimal turnaround time. We can predict that they will sometimes take metaphorical and literal short-cuts – even if we cannot predict the details of these short-cuts. A risk assessment based on causation will tend to look for the ways in which short-cuts can be taken, and relies on the cleverness of the assessor to identify all possible short-cuts; a risk assessment based on intentionality will tend to look for the reasons for taking short-cuts, and assume that if there is an intention the actors will be sufficiently clever to find a way of fulfilling that intention.

The final benefit was that intentionality contributes to finding better ways of mitigating risks. Relying on causal analysis essentially produces models of the

stimulus-response kind that are likely to indicate the wrong kinds of remedy. If you are looking at rule violation as a source of risk, for instance, a causal or stimulus-response view seems likely to indicate that you should provide incentives to increase rule compliance, or penalties to reduce violation. But we know rule violations are often the products of behaviour that has its own kind of rationality, and that forcing compliance simply brings different, possibly worse consequences than violation. The best way of finding out how to deal with rule violations is surely to understand why people might develop intentions that involve them in violating rules. In the case study, as in most systems, there are risks both in complying with rules and procedures and in violating them – so a simple-minded calculus of raising the costs of either compliance or violation looks inappropriate.

It is possible, of course, to concentrate on agency and wilfulness to the exclusion of all else. Wisniewski (2005) reminds us that, although some intentional actions involve much cognitive effort, in other situations ‘all reflection drops out of the picture’. Reason, Carthey, and de Leval (2001) suggest that the ‘illusion of free will’ is one of the factors that produces an excessive, and safety-reducing, tendency to blame people for bad outcomes. And Lützhöft and Dekker (2002) claim that accident analyses tend to explain failures in terms of human motivations in the face of evidence that people’s behaviour is shaped by their tools and tasks. What we need to aim for then is some kind of balance between analysis that simply ignores actors’ agency and their capacity to develop intentions, on the one hand, and denies the causal influence of context and constraint, on the other.

### *Collective intentions and social objects*

One of the criticisms of Searle’s view that collective intentions confer particular functions on certain objects is that it is unclear what the collective intention really amounts to – whether it is an agreement, mere acceptance, or really something that is imposed on a group of people (Ruben 1997). In the case of formal organizations, like companies, it is very likely that the intentions that are attributed to the organization have not been specifically agreed to by a majority of individuals within the organization. However, as the basis for a method of risk analysis, the idea of what a collective intention ‘really’ is does not need to be settled. The whole point of the analysis is to examine what it means in particular situations. For example, two of the accidents we listed earlier involved the role of air traffic controllers in manoeuvres on the ground, and the differing interpretations that different actors appeared to have of this role. It is thus useful, for the purposes of risk analysis, to ask what kind of collective intention we are really talking about when we say that a particular object has a particular function according to a collective intention. From the standpoint of those theorising about social meaning the ambiguity of collective intentionality is a problem; from the standpoint of those interested in identifying risks, it is an opportunity.

Searle’s view on social objects is that they are not particularly primary in the analysis of social meaning. It is social activities that come first, and social objects follow. The ramp is an object that is the way it is because of what people do there: it is not something that comes before what people do there. Again Ruben (1997) has a critique. This is that some social objects do seem that way – for example money is not much more than the pattern of activities that uses money. But there are other

objects that seem to be more than just activity, such as complex social organizations like a nation or a firm. This difference is again something that our approach can benefit from, however. Objects constituted just by activity seem likely to be more vulnerable to misuse or neglect if there is nothing more to them than the way people regularly behave. Objects where there has to be a lot of prior design and negotiation and institutionalisation are perhaps more likely to resist neglect. Given what is at stake, aviation ramp operations are highly institutionalised. On the other hand, objects constituted by activity might be more responsive to necessary change, precisely because they do not need extensive institutional re-design. Thus the relationship between social object and social activity is another issue where the lack of a theoretical settlement is an opportunity rather than a threat to risk analysis.

### Conclusion

The approach we have proposed – to use ideas about intentionality to identify risks of organizational breakdown and then physical harm – looks weak by comparison with engineering methods. The risks that are identified are not identified with much precision, and there is no way of judging the completeness of any analysis. Moreover, some writers on intentionality, and collective intentionality in particular (Saaristo 2006), argue that the whole concept of intentionality is beyond empirical verification: it provides us with a way of describing behaviour that fulfils the conditions of intentionality largely because we believe in intentionality. It could also be argued that, by concentrating on risks of accidental breakdown rather than deliberate subversion, we have excluded the kind of risk in which intentionality is most clearly seen. But it would be wrong to give up on analysing the intentions behind accidents when they are so central to how we think about people collectively keeping inherently hazardous systems safe. These systems and their various defences do not arise from mere desiring: they require extensive, collective intentions. It is problems with such intentions that often seem to be the source of organizational collapse.

Our proposal has been to concentrate the analysis on the main social objects to be found in such systems. It follows Searle's idea to look at the collective intention that confers on these objects the functions they have. But it takes this as problematic and so looks at how this collective intention could contradict the individual intentions that actors develop, and the potential this brings for a breakdown of some kind and the physical hazards that can follow. The advantage of this approach is not only that it helps us understand how intentions go wrong in a hazardous system, but also that it gives us more insight than other methods into the nature of responsibility and how different actors deliberate in different ways.

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